kinds of trivalent metals such as $^{67}\text{Ga}$, $^{68}\text{Sc}$, $^{177}\text{Lu}$, $^{169}\text{Yb}$, $^{166}\text{Ho}$, $^{169}\text{Tb}$, $^{155}\text{Gd}$, $^{152}\text{Eu}$, $^{153}\text{Sm}$, $^{146}\text{La}$. This radioisotopes was injected in tumor-bearing mice. The mice were sacrificed 48 hrs after injection. The tumor, liver, bone, spleen, kindney, pancreas and thymus were analyzed. The gamma-ray spectra of these radionuclids in each organ were simultaneously measured by Ge(Li) semiconductor detector.

(1) There seems to be a relationship between the accumulation of trivalent metals in biological organs and ionic radius. It has been classified into 3 types as follows: diminishing, parallel and increasing types.

(2) To explain a larger accumulation of Gallium than of other trivalent elements in the tumor cell, we would like to postulate that Gallium might pass through the tumor cell membrane much more easily than the other elements because the ionic radius of gallium (0.62 Å) is similar to that of magnesium (0.66 Å) which plays an important role in the transport process. However, we think that the calcium element plays less important role in the transport.

(3) The accumulation of Eu in biological organs revealed a high anomaly in all organs with the exception of the liver. A similar tendency was seen in the earth and lunar rook samples.

The Mechanism of Uptake of $^{169}\text{Yb}$ in Tumor
—in compounds with $^{67}\text{Ga}$ and $^{111}\text{In}$—

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As the tumor affinity agents are well known such as $^{67}\text{Ga}$-citrate, $^{111}\text{In}$-citrate, $^{169}\text{Yb}$-citrate, $^{203}\text{Hg}$-chlormerodrin, $^{203}\text{Hg}$-glutathione, $^{206}\text{Bi}$-acetate, $^{131}\text{I}$-human fibrinogen and $^{57}\text{Co}$-bleomycin. The mechanism of isotope localization within the tumor is not known, but some compounds of group III (Ga, In, Yb) and periodic VI (Hg, Bi) in the periodic table is suggested that the affinity mechanism is caused with biological behavior of individual elements. At this time, it is known that some tumor affinity compounds of group VI were superior to these of group III in binding capacity to the protein by our experiments. In the results of our own experiments, it was considerable that affinity mechanism of elements in group III differed from periodic VI.

The difference of their in vivo distribution between $^{169}\text{Yb}$, $^{67}\text{Ga}$ and $^{111}\text{In}$ was investigated in order to know exactly the property by using Yoshida sarcoma bearing rats. In this investigation, there was no remarkable difference of the uptake in tumor tissue between these elements. But large difference in the biological properties of these compounds was observed about the retention value in the blood and the uptake rate in the bone. $^{169}\text{Yb}$ was rapidly cleared from the blood and was taken mostly into the bone. So the retention values in the soft tissues became very small.
On the other hand, $^{111}$In was slowly and slightly taken into the bone from the blood, so the retention values in the soft tissues was remaining relatively high. $^{67}$Ga showed the intermediate value of bone uptake rate between $^{169}$Yb and $^{111}$In.

Deposition in Tumor and Inflammation of $^{169}$Yb, $^{99m}$Tc- and $^{57}$Co-bleomycin, with Special Reference to $^{67}$Ga and $^{111}$In

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Our interests in new tumor imaging agents are (1) if they would more selectively deposited in malignancies, and (2) if they not be accumulated in inflammatory lesions. Simultaneous, binuclidal studies with $^{169}$Yb, $^{67}$Ga and $^{99m}$Tc-bleomycin were undertaken in rabbits bearing VX-2 experimental carcinoma. $^{169}$Yb was cleared from the blood faster than $^{67}$Ga, and this resulted in a higher tumor to blood concentration ratio of the former radioisotope. The tumor masses were clearly scanned with either agent. Clinical tumor imaging was also attained successfully by either agent.

High VX-2 concentration was achieved in the case of $^{57}$Co-bleomycin as well, and scanned positive.

Deposition in the typhoid vaccine-induced exudative inflammation was assessed of the tumor imaging agents. The concentration ratio to the control subcutaneous tissue was as follows: $^{99m}$Tc pertechnetate 1.4, $^{67}$Ga 3.4, $^{111}$In 2.7, $^{169}$Yb 5.2, $^{99m}$Tc bleomycin 1.5, and $^{57}$Co-bleomycin 5.0.

Development of tumor imaging agents that would not be deposited in inflammatory lesions is so badly needed in order to efficiently cope with daily clinical problems.

Detection of the Extent of Malignant Lymphoma with Gallium-67 Whole Body Scanning

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Gallium-67 citrate has been used in several malignant tumors. In this series, we studied 17 cases of malignant lymphoma (reticulum cell sarcoma:12 cases, others:5 cases) with whole body scanner. Patients were received 1.0–1.5 mCi Ga-67 citrate intravenous injection 72–96 hours prior to scanning. The equipment used in our clinic was a whole body scanner with dual head (12.7 cm) and with 85 hole focused cone.